REMARKS/ARGUMENTS

Claims 1-16 are pending in this application. Claims 1-16 have been amended.

The claims were reworded to substitute the routinely used "wherein" for the less common "characterized in that" and to delete all drawing reference numerals from them. These changes were made for purposes of clarification unrelated to patentability concerns.

Applicants note with appreciation that all claims are substantively allowable.

CLAIM REJECTIONS - 35 U.S.C. § 103(a)

1. Claims 1-7 and 9-15

Claims 1-7 and 9-15 were rejected under 35 U.S.C. 103(a) as being unpatentable over Iwata (U.S. Patent No. 5,293,538) in view of Mitsuhiro (JP 2003-247952).

The Office Action states that Iwata discloses all the features of the claimed invention except for means for obtaining information on light scattered in the first layer and the second layer of the object from the representation. The Office Action further states that this deficiency of Iwata is overcome by Mitsuhiro, which discloses means for obtaining information on light scattered in the first layer (numeral 4 of Fig. 4) and the second layer (numeral 2 of Figs. 5 and 6). Applicants respectfully traverse this rejection for the reasons set forth below.

The term "scattered light" in the present invention has a different meaning than in the referenced documents, because "scattered light" can be used to denote two different phenomena. In a colloquial sense, which is used by Iwata and Mitsuhiro, "scattered light" is understood as multi-directional beams of light reflecting off the surface of a layer. In this application, the term "scattered light" is used in a strict scientific sense. A person skilled in the art of optical measurements would have at his disposal a college textbook "Optics" by Eugene Hecht (Addison-Wesley Publishing Company, Second Edition, 1990, ISBN 0-201-11609-X). This reference on page 63 explains the scattered light as follows:

Consider an incident or primary electromagnetic wave impinging on a dielectric. As we have seen, it will polarize the medium and drive the electron-oscillators into forced vibration. They, in turn, will reradiate or scatter energy in the form of electromagnetic wavelets of the same frequency as that of the incident wave.

[...]

*The way this actually occurs can better be appreciated in Fig. 3.31, which depicts a sequence in time showing two molecules A and B interacting with an incoming plane wave - a solid line represents a wave peak (a positive **E**-field), and a dashed line corresponds to trough (a negative **E**-field). In Part (a) of the figure the incoming plane wavefront impinges on molecule A, which begins to scatter a spherical wavelet. [...] Accordingly, molecule A begins to radiate trough in response to being driven by a peak. Part (b) shows the scattered spherical wavelet and the primary plane wave overlapping, marching out of step, but marching together. And another wavelet is emerging from A. In (c) a trough of the primary wavefront is incident on B, and it, in turn, begins to reradiate a wavelet, which must also be out of phase by 180°. In (d) we see the whole point of the diagram - all the wavelets are moving forward with the primary wave.*

[...]

Within the transparent medium the primary and secondary waves overlap and, depending on their amplitude and relative phase, generate the net refracted disturbance (i.e. reflected and scattered light from layer 2b in Fig. 6 of the presently pending application - comment of the undersigned).

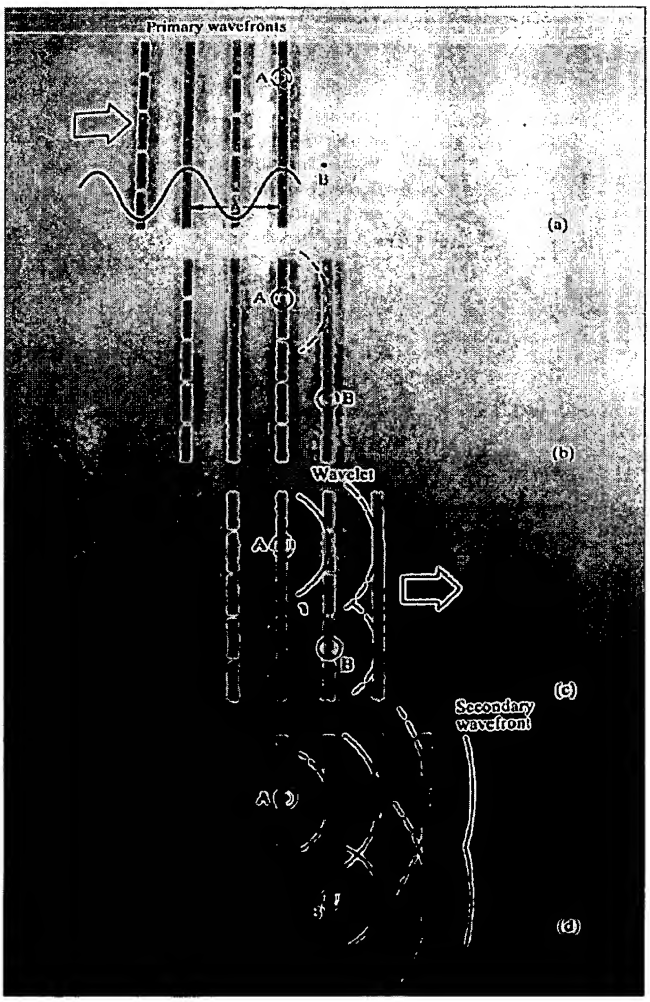


Figure 3.31

In the present invention the term "scattered light" is to be understood in its scientific meaning, i.e. as the light penetrating the material of the object and re-emerging after dispersing within the material at a different location from that at which it entered giving a bright region around the point/line of incidence. How this occurs depends on the internal characteristics of the material. In the wood industry, this is often called tracheid effect.

As explained in paragraph 0037 of the presently pending application, if the first layer 2a predominantly transmits and reflects the light, whereas the second layer 2b predominantly scatters the light, both the reflected and the scattered light will be ultimately detected by the sensor 6. The resulting light intensities may be seen in Fig. 5c of the presently pending invention, in which the directly reflected light is seen as a dashed line A and the scattered light as a solid line B.

Iwata's invention is intended, inter alia, to detect particle impurities which exist in the protection layer: "If a transparent foreign particle 6 exists on the illumination light path, the light is scattered on the particle surface." (column 6, lines 24-26) Notice that Iwata refers to a multi-directional light reflection off the impurity surface, which he calls "scatter" in a colloquial sense, and not to the scatter over the impurity volume, as would be proper if the term "scatter" is used in a scientific sense, like in the presently pending invention.

From Fig. 7 of Iwata it can be clearly seen that the incident light is refracted into the protection layer, because the angle of the incident light is changed due to the refractive index from Θ_1 to Θ_2. That is, the light that was eventually detected by Iwata's light detector after the travel through the protective layer did not include any scattered light component in the meaning of the word "scatter" in this application. Thus, in Fig. 6 of Iwata, the reflection from the detected defect 6, "scattered light 96," is a diffuse reflection (multi-directional beams of light reflecting off the surface of a layer) of the light hitting object 6. Iwata's detector 38 is set up to collect light from the incident light ray and also from the light reflected from defects within the protective material 3. However, the light reflected from the objects further down (e.g. rays 95 in Fig. 6) will not be detected by Iwata since his detector only detects light reflected at the surface.

In Mitsuhiro, the term "scattered light" also has a different meaning from that of the present invention. For instance, in his Detailed Description of the Prior Art, paragraph 0002, Mitsuhiro refers to "a scattered-light component resulting from surface layer irregularity." As in Iwata, it is clear that Mitsuhiro refers to multi-directional light reflection off the surface of the irregularity.

In Mitsuhiro, three types of lights can be identified (see Figs. 15 and 16): directly reflected (specular) light 31, "scattered" light 29, and diffusely reflected light 30. A close inspection of Mitsuhiro's Fig. 15 reveals that his "scattered" light 29 in fact refers to the light reflected off the surface of a small imperfection 32 on the layer 24. Light 31 in Mitsuhiro also arises from the surface of the upper transparent layer 24, whereas the light 30 reflects from the lower layer 25. On the surface of the upper layer, defect 32 has been introduced on pre-determined positions in order to give measurable light reflections 29. None of these reflections have anything to do with internally scattered light in the material as in the presently pending invention.

The Office Action states that Figs. 4 and 5 of Mitsuhiro show light scattered in the first and the second layer of the measured object. However, Mitsuhiro's Fig. 4 shows a specular reflection from the first layer's surface and Fig. 5 shows a diffuse reflection from the second layer's surface. Again, this is not a volumetric based light scattering from the layers in the meaning of the present application. Instead, Mitsuhiro's Figs. 4 and 5 show reflections, specular and diffuse, wherein a diffuse reflection is named "scatter."

Therefore, applicants respectfully submit that claims 1 and 11 are not obvious over Iwata in view of Mitsuhiro. Claims 2-10 and 13-16 are also not obvious over Iwata in view of Mitsuhiro at least because they depend from patentable parent claims 1 and 11.

2. Claims 8 and 16

Claims 8 and 16 were rejected under 35 U.S.C. 103(a) as being unpatentable over Iwata in view of Mitsuhiro, and further in view of Takeda (U.S. Patent 5,936,726). The Office

Action states that Takeda provides the missing polarizer from the Iwata and Mitsuhiro disclosures, thereby making claims 8 and 16 obvious.

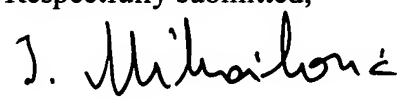
Applicants respectfully submit that, as explained in detail above, the Iwata and Mitsuhiro disclosures do not make claims 1 and 11 obvious. Therefore, claims 8 and 16, which contain all the limitations of their respective parent claims 1 and 11, are also not obvious over Iwata in view of Mitsuhiro. Takeda, who additionally discloses a polarizer, does not overcome the deficiencies of Iwata and Mitsuhiro with respect to the claims 1 and 11 obviousness. Thus, dependent claims 8 and 16 are not obvious over Iwata in view of Mitsuhiro, and further in view of Takeda, at least because they depend from patentable parent claims 1 and 11.

CONCLUSION

In view of the foregoing, applicants submit that this application is in condition for allowance, and a formal notification to that effect at an early date is requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at (415) 273-4317 (direct dial).

Respectfully submitted,



Dr. Jadran (Adrian) Mihailovic
Reg. No. 57,874

TOWNSEND and TOWNSEND and CREW LLP
Two Embarcadero Center, 8th Floor
San Francisco, California 94111-3834
Tel: (415) 576-0200
Fax: (415) 576-0300
JGS:jhw
61311726 v1